# Turning the Tide

a citizen's guide to reducing runoff pollution

# Contents




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# Introduction

## After the rain...

The next time it rains, imagine what happens when the water hits the ground and flows away. Water flowing across streets and parking lots picks up dirt, trash, oil, grease, bits of rubber tires, animal waste and other things left behind by motor vehicles, people and animals. Rain falling on construction sites, farmland, timberland and bare earth becomes muddy with sediment. Golf courses, agricultural fields, home gardens and lawns often add fertilizers and pesticides to stormwater runoff. Septic tanks in water-logged areas can contribute sewage to the runoff. And it all mixes together and flows away as nonpoint source pollution or what is commonly known as runoff pollution.

## Where does it go?

Directly into our streams, lakes, rivers and coastal waters. Besides affecting fish and other wildlife, this kind of pollution can also contaminate our drinking water supplies. In fact, more than half of the water pollution in the United States now comes from runoff pollution. Technically known as nonpoint source pollution, it comes from many sources and is difficult to regulate. Point sources such as outfalls from sewage treatment plants or industrial facilities have been regulated under state and federal laws since the early 1970s. However, pollution from contaminated runoff has only recently become a major target of pollution control efforts. In fact very little stormwater runoff is treated before it reaches a waterway.

## Who's responsible for runoff pollution?

Everyone, in one way or another, is likely to be part of the problem. Which means that everyone can also be part of the solution! This handbook is a guide to the major causes of the problem, and what individuals, families and community groups can do to turn the tide against runoff pollution. It's up to us!

# What's in Runoff Pollution?

## Bacteria and Viruses

Stormwater runoff may become contaminated with raw sewage from failing septic systems, overflowing sewer lines, pet waste, farm animals or wildlife. This runoff can contain bacteria and viruses that may cause illnesses in people following swimming or the consumption of raw or improperly cooked shellfish. Even if the bacteria are not directly dangerous to humans, they can still cause shellfish beds to be closed to commercial and recreational oyster and clam harvesting. This is because when health officials test water quality, they usually don't try to identify every type of bacteria or virus that might be harmful. Instead, they look for bacteria that are always found in the intestines of mammals. If these bacteria are found, they may indicate the presence of other harmful organisms. So when intestinal bacteria are found in waters around shellfish beds, the areas are closed to oyster and clam harvesting to protect human health.

## Trash

Paper, plastic containers and wrappers, cans, cigarette butts, yard waste and other kinds of trash are often dumped into drainage ditches or alongside roadways. When carried into our waterways by stormwater, this trash can cause oxygen depletion, change habitats for aquatic life, and physically damage fish, birds and other animals. Even if trash is buried or burned, harmful substances can still be released from dumpsites or as air pollution.

## Toxic Chemicals

Most households use numerous chemicals that can be harmful if they enter our waterways. Motor vehicle wastes contain a variety of heavy metals such as cadmium, lead and mercury, as well as harmful organic chemicals. Used batteries contain zinc, lead and mercury. Discarded smoke detectors contain radioactive substances.

## Pesticides

Farmers, home gardeners and golf course operators often use various chemicals to control pests. Many households use weed killers, pet shampoos, flea collars and no-pest strips containing chemicals that can be harmful to other plants and animals besides the pests of concern.

## Sediments

Dirt suspended in runoff can increase death among fish eggs and larvae, erode the gills of mature fish, and completely destroy habitats used as spawning areas by many fish. Accumulated sediments can fill stream channels and increase flooding. Suspended sediment can interfere with light needed by aquatic plant life. Sediment particles can attract other kinds of contaminants and become carriers for toxic chemicals and metals like lead and mercury. Contaminated sediments that settle on the bottom of our streams, lakes and coastal waters can pollute water and aquatic life for extended periods.

## Fertilizers & Nutrients

All plants need various nutrients to grow and reproduce. Three major nutrients are nitrogen, phosphorus and potassium, and stormwater can collect these nutrients from fertilizers and household chemicals. Excess nutrients in streams, lakes and coastal waters can cause algae and aquatic weeds to grow to the extent that they compete with fish and other aquatic life for space and oxygen. When the algae die, the large mass of decomposing algae can consume so much oxygen that aquatic life can no longer survive. If unsafe levels of the nutrient nitrite gets into drinking water, it can cause serious health problems, particularly in newborn babies.

## Oxygen-consuming Substances

Like decomposing algae, other kinds of organic material can also consume oxygen as it decays. Bacteria and other microscopic organisms also consume oxygen as they break down organic materials. This decomposition process helps reduce pollution, but large amounts of organic material require more bacteria, which consumes more oxygen. Some chemicals (such as ammonia) also consume oxygen.

## Motor Vehicle Fluids

Antifreeze, battery acid, brake fluid, gasoline and motor oil are poisonous to fish, shellfish and many other forms of aquatic life. They readily accumulate on roads and parking areas, and are easily washed off by rainfall. Some people even dispose of these fluids by pouring them on the ground or down storm drains.

# Runoff Pollution: Where Does It Come From, What Can We Do About It?

## Lawns & Gardens

Well-maintained lawns and gardens can be of real benefit to water quality and the local environment. They add beauty, control erosion, filter runoff from adjacent hard surfaces, reduce dust and help moderate summer heat. But lawns and gardens are often the reason for excessive water use and unnecessary application of fertilizers and pesticides.

### Some Alternative Ways to Control Pests

- Biological Pest Controls — beneficial insects that attack pest
- Traps — sticky traps, pheromone traps and for slugs, beer in a shallow dish
- Removing pest by hand
- Floating row covers — light weight barriers that keep pests off plants
- Insecticidal Soaps — control soft bodied insects such as aphids, white flies, and thrips
- Natural insecticides — made from certain plants, these should be used sparingly

## What Can We Do?

- Reduce soil erosion by planting appropriate plant cover on bare patches of ground.
- Reduce water requirements of your landscaping by selecting plants suited to the local environment with minimal need for supplemental watering.
- Reduce water requirements by using drip irrigation or soaker hoses and by mulching.
- Limit the amount of lawn to what will actually be used for play, recreation, etc., and consider rock gardens or shrubs and trees that also provide habitat for insect-eating birds.
- Group plants with similar requirements and match plants' water requirements with the soil's moisture-holding capacity.
- Do not apply pesticides or fertilizer if heavy rain is expected.
- Plant more trees!

- Use only fertilizers that are really needed, based on soil tests and the specific needs of your plants.
- Keep fertilizer off driveways and sidewalks where it will be washed into storm drains.
- Avoid using fertilizers within 75 feet of a wetland or waterway.
- Consider organic fertilizers (such as blood meal, organic mixes or compost you might make from your own garbage).
- Practice the principles of Integrated Pest Management: select appropriate pesticides, time the application to be most effective with the smallest dose, use pest-resistant crops and encourage natural controls such as pest predators.
- Encourage beneficial birds and insects that reduce pests, build the soil, pollinate plants, and perform other useful functions.
- If you use a lawn care service, request natural management instead of chemical methods, have your soil tested to determine actual needs, examine the labels of all pesticides used, and ensure that required precautions and application methods are followed.
- Contact your County Extension Agent for information on xeriscaping and integrated pest management.

## Some Insect Predators that Control Common Pests

| PREDATORS \ PESTS | Aphids | Aphids Larvea | Carrot Weevils | Caterpillars | Colorado Potato Beetle | Cutworms | Fleas | Flies | Gypsy Moth | Leaf Hoppers | Mexican Bean Beetles | Mites | Psyllids | Rootworms | Treehoppers | White Flies |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Damsel Bug | ✓ | | | | | | | | ✓ | | ✓ | ✓ | | | | |
| Ladybug | ✓ | ✓ | | | | | | | | | | | ✓ | | ✓ | |
| Stingless Wasp | ✓ | | | ✓ | | ✓ | | | ✓ | | | | | | | |
| Green Lacewing | ✓ | | | | | | | | | | | | | | | ✓ |
| Spiders | | | ✓ | | | | ✓ | ✓ | | | | | | ✓ | | |
| Big-eyed Bug | | | | ✓ | | | | | ✓ | ✓ | | | | | | |
| Assassin Bug | | | | | ✓ | | | | ✓ | | ✓ | ✓ | | | | |
| Syrphid Fly | | | | | | | | | | | | | | | | |

# Household Chemicals

Most households contain numerous chemicals that can be dangerous if released into the environment, such as: spot remover, furniture polish, deodorizers, drain cleaner, oven cleaner, disinfectants, moth repellents, ammonia, paint and other finishes, thinners and solvents, batteries containing heavy metals and swimming pool chemicals. These chemicals can become pollutants if residues are discarded with garbage, poured down home drains, into storm drains or onto the land surface.

## What Can We Do?

- When buying household chemicals, read the labels. Select the least toxic product that will do the job and use only when absolutely necessary.
- Try alternatives to toxic chemicals (see "Managing a Home Chemical Spill").
- Use only recommended amounts.
- Keep kitty litter or other absorbent material handy to clean up spills.
- Don't apply chemicals near cisterns, wells or water bodies.
- Don't mix chemicals together.
- Don't burn or bury leftover chemicals or containers.
- Stuff used cans of paint, thinner or other finishes and solvents with newspapers and allow to dry before putting the cans into the trash.
- Never pour household chemicals down drains, storm drains or onto the ground.
- Participate in local programs for hazardous household waste disposal; if there isn't such a program, work with local agencies to start one.

## Managing a Home Chemical Spill

**To clean up small spills:**

- Wear rubber gloves, long pants and rubber boots if a pesticide has been spilled
- If outside, surround the contaminated area with dirt
- Sprinkle sawdust, kitty litter or other absorbent material over the spill
- Shovel or sweep the absorbent material into a strong plastic bag and put it in the garbage
- If the spill is on concrete or other hard surface, wash down with a strong detergent

**If you are uncertain about cleaning up a spill, call the spills hot line: 800-424-8802 or the SC DHEC Hazardous Materials and Oil Spills number: 803-253-6488.**

## Some Alternatives to Hazardous Household Chemicals

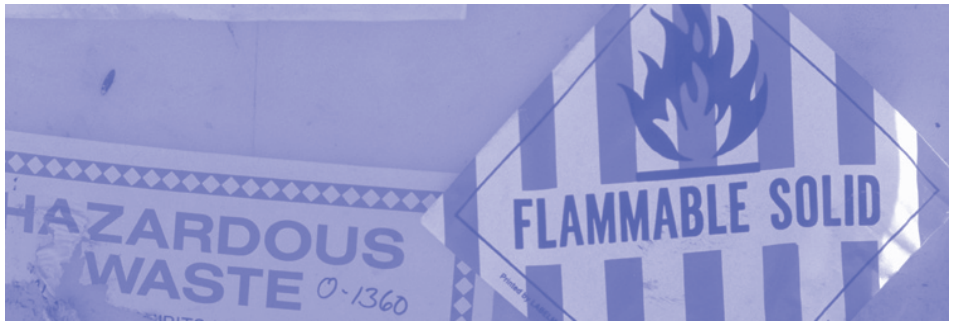
| Instead of... | Try... |
|---|---|
| • Ammonia-based Cleaners | • Vinegar + Salt + Water |
| • Abrasive Cleaners | • Lemon Dipped in Borax or Salt + Baking Soda |
| • Furniture Polish | • Lemon Juice + Olive Oil |
| • Toilet Cleaner | • Baking Soda & Toilet Brush |
| • Oven Cleaner | • Liquid Soap + Borax + Warm Water |
| • Disinfectants | • Water + Borax |
| • Drain Cleaners | • Boiling Water + Baking Soda + Vinegar |
| • Upholstery Cleaners | • Dry Cornstarch |
| • Mothballs | • Cedar Chips or Lavender Flowers |
| • Plant Insecticide | • Soap + Water |
| • Window Cleaner | • White Vinegar + Water |
| • Silver Polish | • Soak in Water + Salt + Baking Soda + a piece of Aluminum |

## Solid Waste Disposal

Food scraps, paper products, wrappers and containers made of glass, plastic or metal are discarded every day by most households. Solid waste is an increasing problem as landfills are becoming more difficult to site and expensive to operate. Runoff seeping through older landfills can carry many contaminants from decomposing garbage. Incinerators can help solve the landfill problem, but are also more expensive to operate and can contribute to air pollution and water pollution by creating acid rain.

### What Can We Do?

- Reduce your consumption of disposable products and products with excessive packaging.
- Buy biodegradable or recyclable products whenever possible.
- Make a compost pit (see "Notes on Composing").
- Never dump grass clippings or other yard waste into or near a waterway.
- Participate in recycling programs.




*Questions about solid waste or recycling?*

Call the SC DHEC Office of Solid Waste Reduction and Recycling:
1-800-768-7348

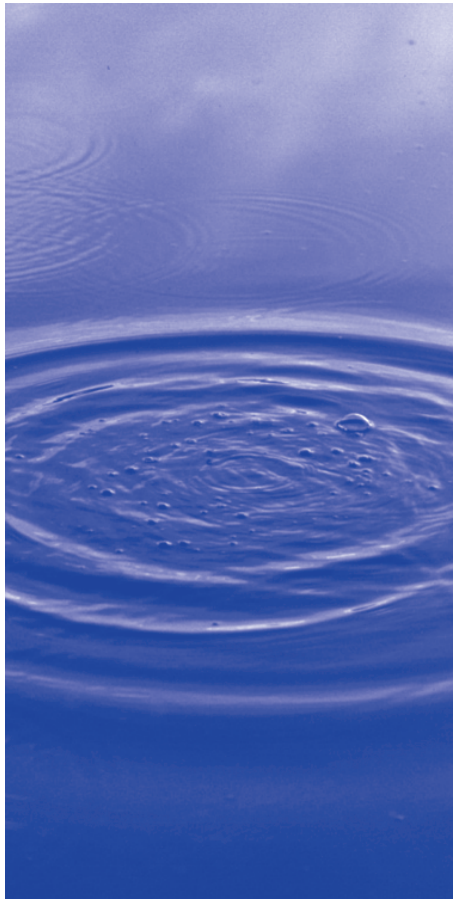
### Notes on Composting

Grass clippings, leaves, fruit and vegetable scraps, crushed eggshells, tea bags and coffee grounds are good candidates for composting.

Two types of composting are possible. **Hot composting** is practical for people with a large amount of waste material and can produce compost in a month. **Cold composting** is better for small amounts of material, but takes at least six months to produce compost.

Compost piles can be as small as 3 ft x 3 ft x 3 ft, but smaller piles may not be able to hold enough heat for composting. Compost piles larger than 5 ft x 5 ft x 5 ft may not get enough air to support compost bacteria at the center of the pile.

For complete instructions on composting, contact your County Extension Agent (see **Local Resources** section).

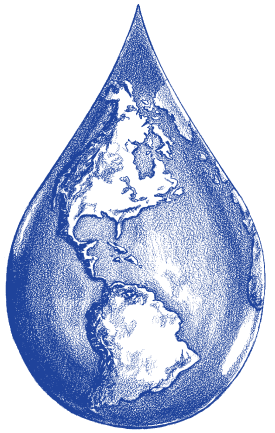


# Excessive Water Use

Unnecessary water use not only contributes to local water shortages, but also adds to the volume of wastewater that must be treated by septic tanks or sewage treatment plants. As a result, excessive water use contributes to higher bills for energy, water and sewer services. The average person in the United States uses about 100 gallons of water each day; only four gallons are actually essential to life. We could decrease our water consumption by 15 percent to 20 percent simply by adopting better water use habits.

## What Can We Do?

- Check for toilet leaks by putting food coloring into the tank. If colored water appears after 30 minutes without flushing, there is a leak that should be repaired.
- Turn off water and your hot water heater when going on a trip.
- Take short showers instead of baths.
- Don't run water continuously when washing dishes, brushing teeth, shaving, etc.
- Consider eliminating your garbage disposal, as these devices not only consume large amounts of water, but also add organic materials to sewage treatment systems.
- Install a water-conserving shower head.
- Run dishwashers and clothes washers only when you have a full load.
- Reduce the volume of your toilet tank with plastic bottles filled with water (don't use bricks!); you'll have to experiment to find the minimum volume needed for satisfactory operation.
- Install low volume toilets.



## Motor Vehicles

The oil from a single automobile engine can produce an eight-acre oil slick, and a single quart of motor oil can contaminate as much as two million gallons of drinking water. Used oil, antifreeze and other motor vehicle fluids are often dumped into storm drains or roadside ditches. The pollution caused by improper disposal of used motor oil in the United States is equal to fourteen Exxon Valdez spills every year! The problem is even worse if we consider the oil, grease and other fluids that leak from poorly maintained vehicles and contaminate runoff from roads, driveways and parking lots. Many cats and dogs have died after drinking sweet-tasting water from puddles contaminated with antifreeze.

### What Can We Do?

- Maintain motor vehicles and repair leaks promptly.
- Dispose of used motor oil in oil recycling centers.
- Arrange with local service stations or recycling centers to take your used antifreeze.
- Avoid gas tank overflows during refueling by determining the amount of fuel needed based upon estimated fuel consumed and the capacity of the fuel tank.

# Boats

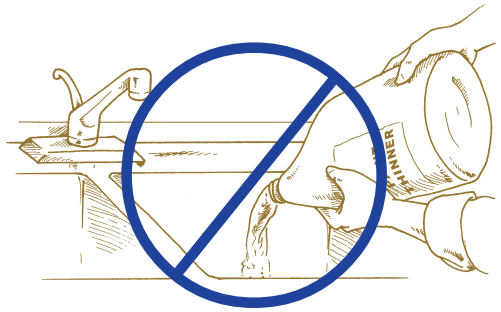
Recreational boaters use a variety of cleaners, finishes and antifouling compounds, and are often responsible for discharging garbage, sewage and petroleum products into our waterways. Boats that create excessive wakes contribute to shoreline erosion and increase sediment loads to adjacent waterways.

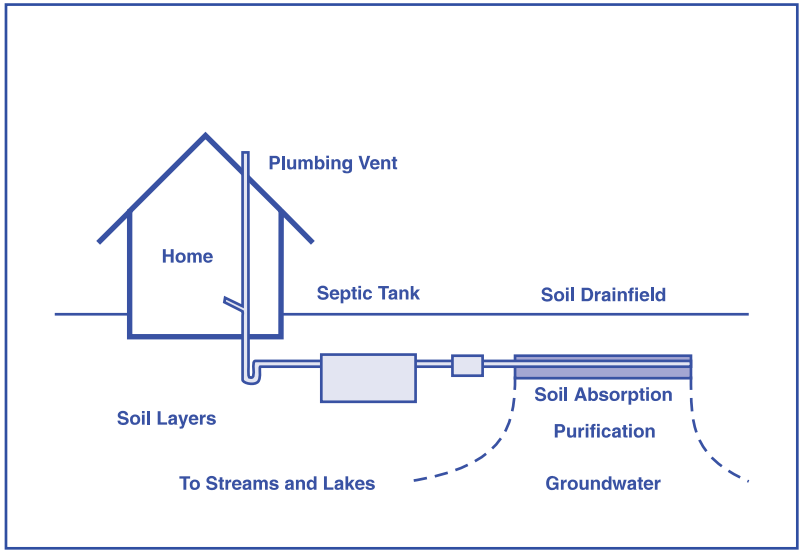
## What Can We Do?

- Avoid producing wakes within 500 feet of shore.
- Scrub boats with brush and water instead of routinely using soap or detergent.
- If cleansers are needed to remove stains, use phosphate-free detergents.
- Don't use toxic polishes and stain removers.
- Avoid gas tank overflows during refueling by determining the amount of fuel needed based upon estimated fuel consumed and the capacity of the fuel tank.
- Do not direct discharge boat sewage into waterways.
- "Stow it, don't throw it"; bring trash ashore for recycling or disposal.
- Use a drop cloth when scraping boat hulls to catch toxic chips of paint or antifouling.
- Encourage marina operators to use porous paving and adopt other runoff control practices described under "Hard Surfaces."
- Use low emission engines.

# Septic Tanks

A properly operating septic tank system can be a safe and effective means of disposing of household wastewater. The whole process depends upon bacterial action and soils that can absorb the outflow. If the drain field is damaged or the soil becomes saturated, nearby wells and surface waters may become contaminated with sewage products including bacteria, solids and oxygen-consuming substances.






## What Can We Do?

- Keep heavy vehicles and plant roots away from drain field pipes.
- Avoid putting household chemicals down the drain that could destroy bacteria in the septic tank.
- Conserve water and stagger water-intensive uses (like laundry) that could overload the system.
- Have the system inspected annually and pumped out every three to five years.
- Consider giving up garbage disposals that add unnecessary solids and grease to the system.
- Keep oils, fats and grease, coffee grounds, cigarettes, facial tissues, paper towels, sanitary napkins, tampons and disposable diapers out of the system.
- Use toilet paper that decomposes quickly.
- Be alert for bright green grass growing over the drain field that could indicate sewage effluent near the surface.
- Divert runoff from the drain field area to reduce the likelihood of saturating the soil.

## Animal Waste

Animal wastes are high in nutrients as well as bacteria and can contribute to excessive plant growth in waterways as well as closure of shellfishing beds and swimming areas because of bacterial contamination. Many pet owners do not believe that their one animal could make much difference, but when the wastes from all the pets in a typical neighborhood are added together, the impact is significant.

### What Can We Do?

- Clean up after pets and dispose of wastes in the trash or toilet.
- Bury pet waste or use commercially available pet waste composters.
- Don't feed waterfowl.

## Hard Surfaces

Paved roads, driveways, rooftops and parking lots are common in most communities. Unlike forests and fields which allow rainwater to soak into the ground, these hard surfaces cause rainwater to flow rapidly into ditches and storm drains – and directly into our waterways. Because of this rapid runoff, a typical city block generates nine times more runoff than a woodland of the same size.

## What Can We Do?

### Keep Surface Runoff Clean

- Follow suggestions for septic tanks, animal wastes, motor vehicles, farms, lawns and gardens.
- Incorporate retention ponds, oil and grease separators, etc., into designs calling for large paved surfaces (see **Resources** section for more details).

### Reduce Surface Runoff

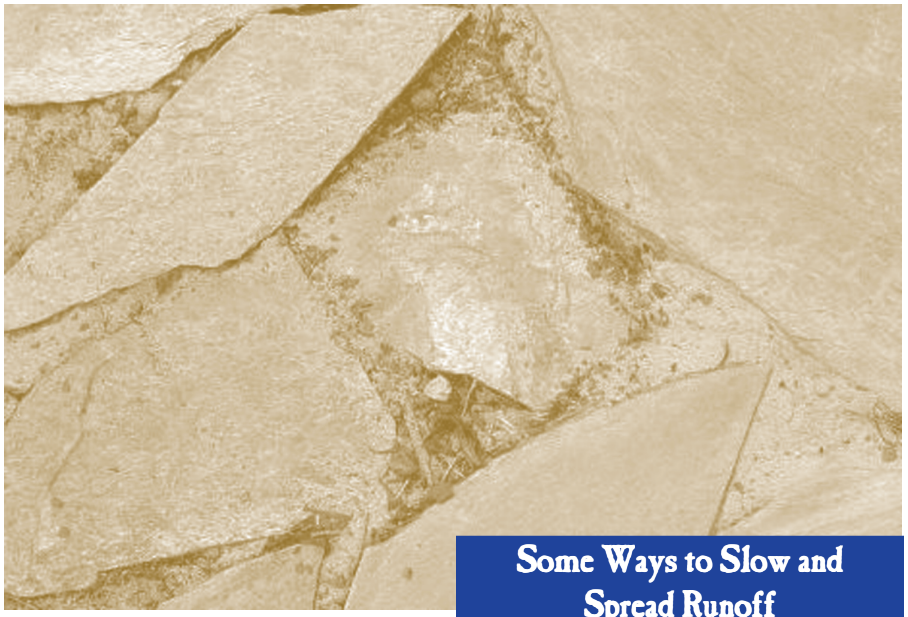
- Wash your car only when necessary.
- Use a bucket or pistol grip nozzle to keep from running water unnecessarily.
- Limit paved or other impervious surfaces on your property and consider alternatives to solid concrete.
- Before washing your car, park on paving blocks or gravel (you may be able to park on grass and water the lawn at the same time, but check with your County Extension Agent to find out whether this would compact the soil excessively).

### Allow Runoff to be Absorbed

- Slow and spread the flow of runoff to allow absorption into the ground.

## Some Alternatives to Solid Concrete

- Bricks
- Interlocking pavers
- Flat stones
- Gravel
- Crushed stone or shell
- Bark chips
- Precast concrete lattice pavers
- Wood or recycled plastic lumber decks



## Some Ways to Slow and Spread Runoff

- Channel runoff into basins, hollows and depressions which can act as temporary holding areas.
- Contour or terrace gardens to reduce runoff and erosion.
- Plant vegetation to take advantage of wet areas and to reduce the impact of direct rainfall.
- Install gravel trenches (at least 12 inches wide and 3 feet deep) along driveways or patios.

## Farms

Croplands, pastures and ranges contribute more sediment, oxygen-consuming substances, nitrogen and phosphorus to surface waters in the United States than all other sources of polluted runoff combined. Because of the large amounts of land devoted to these uses (about 420 million acres), it is especially important for farms to properly manage animal wastes, plant cover removal and application of chemicals. Poor farming practices can result in stormwater runoff contaminated with sediment, nutrients, pesticides, bacteria and oxygen-consuming substances.

In many cases, nonpoint source (polluted runoff) contamination can result from accepted farming methods that have been used for many years. This contamination can be reduced by improved land management and by constructed systems that contain or reduce pollutants at their source.

## What Can We Do?

- Plant vegetation at the base of steep slopes and in drainage ditches to slow the rate of runoff and trap pollutants.
- Keep heavy equipment off exposed soil during rainy periods.
- Practice conservation tillage, a variety of techniques such as inter-cropping that avoid leaving large areas of exposed soil for extended periods.
- Construct detention ponds and basins to slow runoff and trap sediment.
- Control animal grazing to prevent pasture overgrazing.
- Drag pastures frequently to spread manure and promote uniform grazing.
- Leave wetlands, stream banks, channels and streamside vegetation in their natural condition to provide a buffer between cultivated areas and waterways.
- Adopt the principles of Integrated Pest Management: select appropriate pesticides, time the application to be most effective with the smallest dose, use pest-resistant crops and encourage natural controls such as pest predators.
- Locate feed and nutrient storage facilities away from streams and drainages.
- Provide storage facilities (this may be as simple as a canvas cover over a manure pile) that prevent collected animal wastes from washing away.
- Apply liquid manure during dry months when there is less chance of water contamination and during the active growing season when nutrient uptake by plants is at its maximum.

- Locate areas of heavy animal use where runoff cannot mix with manure.
- Fence animals away from streams.
- Follow approved waste management plan.

# Forestry

Because forested watersheds act as filter systems for runoff, they are important to drinking water supplies, recreation and fisheries. These benefits can be impaired by forestry practices that cause polluted runoff. Road building, harvesting, logging and pesticide application can pollute water with sediments, chemicals and organic materials unless precautions are taken to control such contamination.

## What Can We Do?

- Plan and construct roads to minimize disturbed area and control sediment loss.
- Minimize stream crossings by roads.
- Revegetate and close roads that are no longer needed.
- Establish buffer strips (generally 40 to 80 feet wide) along streams; for details, contact your local representative of the South Carolina Forestry Commission.
- Consider special logging, harvesting, storage and hauling techniques that minimize soil disturbance.
- Follow guidelines for pesticide and fertilizer application described under "Lawns and Gardens."
- Use forestry best management practices and hire contractors that use them.

## Construction

When land is cleared for building or road development, loose sediment and other materials washed from work sites can pollute our waterways. Sediment in runoff not only affects stream habitats but also can carry with it pesticides, cleaning solvents, cement wash, asphalt, and motor oil.

### What Can We Do?

- During construction, leave and protect as much existing vegetation as possible.
- Use and maintain recommended construction best management practices (BMPs) such as sediment fences, hay bales, and sediment detention ponds.
- Protect bare soil with mulch, and plant vegetation for long term coverage.
- Leave or plant buffers of trees and shrubs along waterways.

## What Can We Do?

### Conserve Energy!

- Turn off lights, televisions, stereos and radios in unoccupied rooms.
- Consider using appliances that do not require electricity or fossil fuel (such as manual can openers and push-type lawn mowers).
- Pay attention to energy-efficiency ratings on new appliances and automobiles.
- When possible, walk or bicycle instead of driving.

## Air Emissions

Rainwater can be contaminated before it even hits the ground if it falls through polluted air. In the Chesapeake Bay, air pollution has been estimated to account for as much as 25% of pollution from nitrogen compounds. Acid rain is the most familiar example of this type of contamination. Air pollution with sulfur and nitrogen compounds results primarily from burning fossil fuels, especially coal and oil. These fuels are burned primarily for electricity production and motor vehicle transportation.

- Keep doors and windows closed when air conditioners or heaters are in use.
- Investigate alternative energy sources such as solar and wind power.
- Keep refrigerators closed as much as possible.
- Set thermostats to 68  in winter and 75  in summer; you may be able to use heaters and air conditioners even less if you can take advantage of warming by the sun or cooling by wind.
- Every three months, vacuum the coils on the bottom or rear of refrigerators to remove dust.

# Glossary

**Acid rain** – rainwater which becomes acid due to sulfur dioxide and nitrogen oxide in the air

**Aquifer** – large concentration of groundwater similar to an underground lake

**Best management practice (BMP)** – a method, activity, maintenance procedure or other management practice for reducing the amount of pollution entering a water body

**Biochemical oxygen demand (BOD)** – the amount of oxygen needed by living organisms in a body of water; high BOD is often due to the presence of large numbers of micro-organisms that break down complex organic substances including pollutants

**Biodegradable** – able to be broken down by living organisms

**Buffer** – an area of trees, shrubs and herbaceous vegetation located upslope from a waterbody

**Carcinogen** – a substance known to cause cancer

**Chemical oxygen demand (COD)** – oxygen consumed by chemicals introduced into a water body

**Combined sewer overflow (CSO)** – a pipe that discharges untreated wastewater during storms from a sewer system that carries both sanitary wastewater and stormwater; overflow occurs because increased flow caused by stormwater runoff exceeds the capacity of the system

**Combined sewer system** – a system to collect and treat wastewater where domestic and industrial wastewater is combined with storm runoff; stormwater is treated in this type of system, but the system may be overloaded by runoff from major storms, resulting in discharge of untreated sewage

**Compost** – fertilizer made with nonmeat food scraps, leaves, grass clippings, soil and water

**Contaminant** – a substance that adversely affects the environment

**Cumulative effects** – the combined environmental impacts that accumulate over time and space from a series of similar or related individual actions, contaminants or projects; while the individual impacts may seem minor, the combined effect can be severe

**Detention** – collecting and holding back stormwater for delayed release to receiving waters

**Disposal** – methods by which unwanted materials are relocated, contained, treated or processed; unless contaminants are removed or made less harmful, they may be released again into the environment

**Dissolved oxygen** – oxygen present in water and therefore available to fish and other aquatic life

**Erosion** – wearing away of rock or soil through the gradual detachment of soil or rock fragments by water, wind, ice and other mechanical and chemical forces

**Eutrophication** – overenrichment of water by phosphates and/or nitrogen which causes organisms to reproduce at increased rates

**Fecal coliform bacteria** – bacteria normally found in the intestinal tracts of warm-blooded animals; these bacteria are normally harmless to humans, but are used as indicators of the presence of sewage that may contain harmful bacteria and viruses; high fecal coliform bacteria levels can be caused by waste

from animals other than humans, including household pets, farm animals and wildlife

**Groundwater** – underground water supplies stored in aquifers; the source of groundwater is rain which soaks into the ground and flows down until it is collected at a point where the ground is not permeable

**Habitat** – the specific area of environment in which a particular type of plant or animal lives

**Herbicide** – a substance used to destroy or inhibit growth of vegetation

**Leachate** – water or other liquid that has washed (leached) from a solid material such as a layer of soil or debris; leachates may contain contaminants

**Nonpoint source pollution** – contamination that comes from many diffuse sources rather than from a specific point such as an outfall pipe

**Nutrients** – chemicals required by plants or animals for growth; often used to refer specifically to nitrogen, phosphorus and potassium needed by many plants

**Pathogens** – micro-organisms that cause disease

**Photodegradable** – able to be broken down by sunlight

**Point source pollution** – contamination that comes from a specific definable source

**Pollution** – an undesirable change in the physical, chemical or biological characteristics of air, land or water that is detrimental to human life, desired activities or other species considered important by humans

**Polychlorinated biphenyls (PCBs)** – chemicals used in electrical transformers; now banned in the United States, but still cause widespread contamination from previous use

**Sediments** – soil particles carried into water bodies

**Septage** – the sludge and scum materials that are pumped out of a septic tank

**Storm drain** – a system of gutters, pipes or ditches used to carry stormwater from surrounding lands to streams, lakes or coastal waters

**Stormwater** – water that is generated by rainfall

**Toxins** – chemical substances that can cause cancer or other harmful effects; toxins include heavy metals such as cadmium, lead and mercury, as well as organic compounds like petroleum products, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs)

**Turbidity** – a measure of the amount of material suspended in water

**Water quality** – a term that reflects the condition of water which is affected by natural processes and human activities; water quality means different things to different people, depending upon what they wish to do with the water (good water quality to a fisherman may mean plenty of fish to catch; good water quality to a public health official may mean that the water is safe to drink or swim in, etc.)

**Watershed** – the geographic region within which water drains into a particular body of water

**Wetlands** – habitats where the influence of surface or groundwater has resulted in development of plant or animal communities adapted to aquatic or intermittently wet conditions

# Resources

## Agencies with Nonpoint Source Programs

**Cooperative Extension Service**
130 Long Hall
Clemson University
Clemson SC 29634
(864) 656-1550

**Department of Pesticide Regulation**
Clemson University
511 Westinghouse Road
Pendleton SC 29670
(864) 646-2150

**Department of Natural Resources**
**Division of Conservation, Education and Communication**
PO Box 167
Columbia SC 29202
(803) 734-3888

**Lake and Watershed Association of SC**
PO Box 1241
Irmo, SC 29063

**Department of**
**Natural Resources**
**Division of Marine Resources**
217 Ft. Johnson Road
PO Box 12559
Charleston SC 29422-2559
(843) 762-5000

**Land and Waste Management –**
**SC DHEC**
2600 Bull Street
Columbia SC 29201-1708
(803) 896-4000

**Division of Environmental**
**Health On-Site Wastewater**
**Management Branch**
SC DHEC
2600 Bull Street
Columbia SC 29201-1708
(803) 896-0641

**Office of Ocean and Coastal Resource Management**
**SC DHEC**
1362 McMillan Ave, Suite 400
Charleston SC 29405
(843) 744-5838

**SC Forestry Commission**
PO Box 21707
Columbia SC 29221
(803) 896-8817

**SC Sea Grant Consortium**
287 Meeting Street
Charleston SC 29401
(843) 727-2078

**Department of Natural Resources**
**Land Water and Conservation Division**
Affinity Building
1201 Main Street, Suite 1100
Columbia SC 29201
(803) 737-0800

**USDA Forest Service**
4931 Broad River Road
Columbia SC 29212-3530
(803) 561-4000

**USDA Natural Resources**
**Conservation Service**
1835 Assembly Street, Room 950
Columbia SC 29201
(803) 253-3977

**Bureau of Water –**
**Nonpoint Source – SC DHEC**
2600 Bull Street
Columbia SC 29201-1708
(803) 898-4300

**SC Coastal Conservation League**
456 King Street
PO Box 1765
Charleston SC 29402
(843) 723-8035

## Clemson University Cooperative Extension Service County Agents

| | | | | | |
|---|---|---|---|---|---|
| Abbeville | (864) 459-4106 | Calhoun | (803) 874-2354 | Dillon | (843) 774-8218 |
| Aiken | (803) 649-6297 | Charleston | (843) 722-5940 | Dorchester | (843) 563-3441 |
| Allendale | (803) 584-4207 | Cherokee | (803) 489-3141 | Edgefield | (803) 637-3161 |
| Anderson | (864) 226-1581 | Chester | (803) 385-6181 | Fairfield | (803) 635-4722 |
| Bamberg | (803) 245-2661 | Chesterfield | (843) 623-2134 | Florence | (843) 661-4800 |
| Barnwell | (803) 259-7141 | Clarendon | (803) 435-8429 | Georgetown | (843) 546-4481 |
| Beaufort | (843) 470-3655 | Colleton | (843) 549-2596 | Greenville | (864) 232-4431 |
| Berkeley | (843) 719-4140 | Darlington | (843) 393-0484 | Greenwood | (864) 229-6681 |

| | | | | | |
|---|---|---|---|---|---|
| Hampton | (803) 943-3427 | Marion | (843) 423-8285 | Richland | (803) 929-6030 |
| Horry | (843) 365-6715 | Marlboro | (843) 479-6851 | Saluda | (864) 445-8117 |
| Jasper | (843) 726-3461 | McCormick | (864) 465-2112 | Spartanburg | (864) 596-2993 |
| Kershaw | (803) 432-9071 | Newberry | (803) 276-1091 | Sumter | (803) 773-5561 |
| Lancaster | (803) 283-3302 | Oconee | (864) 638-5889 | Union | (864) 427-6259 |
| Laurens | (864) 984-2514 | Orangeburg | (803) 534-6280 | Williamsburg | (843) 354-6106 |
| Lee | (803) 484-5416 | Pickens | (864) 868-2810 | York | (803) 684-9919 |
| Lexington | (803) 359-8515 | | | | |

## South Carolina Department of Health and Environmental Control
## EQC District Offices

**Appalachia I (Anderson, Oconee)**
2404 N Main Street
Anderson SC 29612
(864) 260-5569

**Appalachia II (Greenville, Pickens)**
301 University Ridge, Suite 5800
Greenville SC 29601
(864) 241-1090

**Appalachia III (Cherokee, Spartanburg, Union)**
975 N Church Street
Spartanburg SC 29305
(864) 596-3800

**Catawba (Chester, Lancaster, York)**
PO Box 100
Fort Lawn SC 29714
(803) 285-7461

**Central Midlands (Fairfield, Lexington, Newberry, Richland)**
PO Box 156, Building #5
State Park SC 29147
(803) 896-0620

**Low Country (Beaufort, Colleton, Hampton, Jasper)**
1313 Thirteenth Street
Port Royal SC 29935
(803) 522-9097

**Lower Savannah (Aiken, Allendale, Bamberg, Barnwell, Calhoun, Orangeburg)**
218 Beaufort Street NE
Aiken SC 29801
(803) 641-7670

**Pee Dee (Chesterfield, Darlington, Dillon, Florence, Marion, Marlboro)**
145 Cheves Street
Florence SC 29506
(803) 661-4825

**Trident (Berkeley, Charleston, Dorchester)**
1362 McMillan Avenue, Suite 300
Charleston SC 29405
(843) 740-1590

**Upper Savannah (Abbeville, Edgefield, Greenwood, Laurens, McCormick, Saluda)**
613 South Main Street
Greenwood SC 29646
(864) 223-0333

**Waccamaw (Georgetown, Horry, Williamsburg)**
1705 Oak Street Plaza, Suite #2
Myrtle Beach SC 29577
(843) 448-1902

**Wateree (Clarendon, Kershaw, Lee, Sumter)**
105 N. Magnolia Street
Sumter SC 29151
(803) 778-1531

# Action Checklists

Use the lists on the following pages to check off the actions you take to reduce polluted runoff around your home or business.  You are the solution to runoff pollution!

# Landscaping

- ❑ Avoid using fertilizers within 75 feet of a wetland or waterway.
- ❑ Do not fertilize if heavy rain is expected.
- ❑ Consider organic, non-chemical fertilizers (such as blood meal, organic mixes or compost made from your own garbage).
- ❑ Practice Integrated Pest Management: select appropriate pesticides, time the application to be the most effective with the smallest dose, use pest-resistant crops, encourage natural controls such as pest predators.
- ❑ Encourage beneficial birds and insects that reduce pests, build the soil, pollinate plants and perform other useful functions.
- ❑ If you use a lawn care service, request natural management instead of chemical management methods, have your soil tested to determine actual requirements, examine labels of all pesticides used and ensure that required precautions and application methods are followed.
- ❑ Contact your County Extension Agent for information on xeriscaping and integrated pest management.
- ❑ Reduce soil erosion by planting appropriate plant cover on bare patches of ground.
- ❑ Reduce water requirements of your landscaping by xeriscaping - selecting plants suited to the local environment with minimal need for supplemental watering.
- ❑ Reduce water requirements by using drip irrigation or soaker hoses and by mulching planting beds.
- ❑ Limit the amount of lawn to what will actually be used for play, recreation, etc., and consider rock gardens or shrubs and trees that also provide habitat for insect eating birds.
- ❑ Group plants with similar requirements; place plants that need more water in naturally wet areas; match plants' water requirements with soil's moisture-holding capacity.
- ❑ Use only fertilizers that are really needed, based on soil tests and the actual requirements of your plants.
- ❑ Keep fertilizer off driveways and sidewalks where it will be washed into storm drains.
- ❑ Use pervious pavers.

## Boats

- ☐ Don't produce wakes within 500 feet of shore.
- ☐ Scrub boats with brush and water instead of routinely using soap or detergent.
- ☐ If cleansers are needed to remove stains, use phosphate-free detergents.
- ☐ Avoid toxic polishers and stain removers.
- ☐ Avoid refueling overflows by determining the amount of fuel needed based upon estimated fuel consumed and the capacity of the fuel tank.
- ☐ Avoid discharging boat sewage into waterways.
- ☐ Do not discharge chlorine-treated waste from marine toilets in waters less than 20 feet deep.
- ☐ Bring trash ashore for recycling or disposal.
- ☐ Use a drop cloth when scraping boat hulls to catch toxic chips of paint or antifouling.

## Solid Waste & Animal Waste

- ☐ Never dump grass clippings or other yard waste into or near a waterway.
- ☐ Participate in recycling programs.
- ☐ Clean up after pets and dispose of wastes in the trash or toilet.
- ☐ Reduce your consumption of disposable products and excessive packaging.
- ☐ Make a compost pit.

## Hazardous Household Chemicals

- ☐ When buying household chemicals, read the labels, select the least toxic product that will do the job and use only when absolutely necessary.
- ☐ Try alternatives to toxic chemicals.
- ☐ Use only recommended amounts.
- ☐ Keep litter or other absorbent material handy to clean up spills.
- ☐ Don't apply chemicals near cisterns, wells or water bodies.
- ☐ Don't mix chemicals together.
- ☐ Don't burn or bury leftover chemicals or containers.
- ☐ Stuff used cans of paint, thinner or other finishes and solvents with newspapers and allow to dry before putting the cans into the trash.
- ☐ Never pour household chemicals down drains, storm drains or onto the ground.
- ☐ Participate in local programs for hazardous household waste disposal; if there aren't any such programs, work with local agencies to start one.

## Septic Tanks

- ☐ Keep heavy vehicles and plant roots away from drain field pipes.
- ☐ Avoid putting household chemicals down the drain that could easily destroy septic tank bacteria.
- ☐ Conserve water; stagger water-intensive uses (like laundry) that could overload the system.
- ☐ Have the system inspected annually and pumped out every three to five years.
- ☐ Consider giving up garbage disposals that add unnecessary solids and grease to the system.
- ☐ Keep out of the system: oils, fats and grease, coffe grounds, cigarettes, facial tissues and paper towels, sanitary napkins, tampons and disposable diapers.
- ☐ Use toilet paper that decomposes quickly.
- ☐ Be alert for bright green grass growing over the drain field that could indicate sewage effluent near the surface.
- ☐ Divert runoff from the drain field area to reduce the likelihood of saturating the soil.

## Motor Vehicles

- ☐ Maintain motor venicles; repair leaks promptly.
- ☐ Take used motor oil to oil recycling centers.
- ☐ Arrange with local service stations or recycling centers to take your used antifreeze.

## Water Conservation

- ☐ Check for toilet leaks by putting food coloring into the tank. If colored water appears after 30 minutes without flushing, there is a leak that should be repaired.
- ☐ Turn off water and your hot water heater when going on a trip.
- ☐ Run dishwashers and clothes washers only when you have a full load.
- ☐ Don't run water continuously when washing dishes, brushing teeth, shaving, etc.
- ☐ Consider eliminating your garbage disposal, as these devices not only consume large amounts of water, but also add organic materials to sewage treatment systems.
- ☐ Install a water-conserving shower head.
- ☐ Reduce the volume of your toilet tank with plastic bottles filled with water (don't use bricks!); experiment to find the minimum volume needed for satisfactory operation.
- ☐ Take short showers instead of baths.